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Gender Disparity Among Indian Library and Information Science Professionals: a 20-year sample of publications from 1999-2018

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Abstract
Gender disparity is present in many research fields including in Library and Information Science (LIS). This paper studied gender disparity among Indian LIS professionals and measure the intellectual output 20 years. The study reviewed 1,195 publications in the LIS field from 1999 to 2018, determining the gender of the first author. An analysis of the publication list determined the yearly contributions of male and female authors, together with the average distributions, yearly citation rates and other metrics, by gender. Across the whole study period, publications first-authored by men outnumbered those by women. Similarly, overall contributions by men were higher than by women. BM Gupta and M Tripathi were the most prolific male and female authors, respectively. "India" was the most common keyword used by both first author genders. “Bibliometrics”, “Digital Library”, “Scientometrics”, “Academic Libraries”, “E-resources” and “web 2.0” were the core research areas of both men and women. When journals were divided into national and international scope, articles by men outnumbered those by women on both levels. However, 65% of the articles published by women were in international journals, compared to 58% of the articles published by men (59% overall), suggesting that the quality of work produced by women was comparable to or higher than the quality of work published by men. Consequently, gender parity in Indian LIS publications may be some way off. As such, further research is required to highlight and mitigate the issues experienced by women in academia in order to increase productivity in the LIS field in India.

Keywords: Bibliometric, Gender Disparity, Gender Gap, Indian LIS Professional, India

Introduction

In recent past years, there has been renewed interest in gender disparity and gender differences in research (Cooray, Verma, & Wright, 2014). The gender gap evident worldwide. Many publications have reported its presence in India (Mukhopadhyay, Chakrabarti, & Marjit, 2009; Ramachandran, 2011; Chaudhury& Sinha, 2020). India is a large country with a high-quality stratified education system (Alam, 2007). Annually, 34.6 million people are registered in India's higher education institutions (Ministry of Human Resource Development, 2016). To enhance the quality of research, the University Grant Commission (UGC), India, recommends that research outputs must be published in journals listed by Scopus, Web of Science or UGC CARE (University GrantsCommission, 2019). Both quantity and quality of publications and citations play a pivotal role in the success of a researcher and are often used as metrics for evaluating an individual's research performance (Peñas& Willett, 2006).

Education in library and information science (LIS) in India started more than 100 years ago in Vadodara (Singh & Moirangthem, 2015) and consequently increased in popularity and scope. In every state, there is at least one university offering courses in LIS, and academic publications in LIS are increasing every year. Such research papers are contributed by both men and women, however, contributions from women are fewer in number than those from men (B T et al., 2018). Gender disparity is seen in every country and varies in degree from from discipline to discipline (Vignola-gagne, Villeneuve, Ge, &Gingras, 2011; West, Jacquet, King, Correll, & Bergstrom, 2013; Eloy et al., 2013). Nevertheless, academic contributions from men outnumber those from women in many states (Sugimoto, 2013). Despite the gender gap in India having reportedly reduced between 2013 and 2017 (Gohain, 2018), there are many reports documenting that women publish less frequently than men (Kosmulski, 2015; Kaw & Ahmad, 2014; Eloy, Svider, Cherla, et al., 2013). Traditionally, the academic discipline of LIS is thought to be female-dominated (Golub, 2010; Scarman, 2013), however, publications from women are fewer in number than those from men. In India, the entry-level LIS course has increased in popularity with both male and female students. Only very few people obtain professional academic qualifications in India. Between 1950 and 2001, there were only 991 instances of the doctor of philosophy (PhD) being awarded in India (Chatterjee & Maity, 2012). This also varies from discipline to discipline, and by country. Gender inequality has been specifically reported in the LIS profession in India (B T et al., 2018; Bisaria & Jaiswal, 2018; Bisaria, 2018). However, existing publications on the gender balance in LIS in India only focus on limited geographical regions and timeframes. Hence, the current study examines gender disparity in the LIS profession in India from 1999-2018, a period of 20 years.

Literature Review

The impact of gender disparity is very different in India compared to the better-studied USA, and the more time passes, the more serious this omission becomes (Thelwall, Bailey, Makita, & Sud, 2019). The United Nations Development Programme (UNDP) reports gender disparity to be ubiquitous, with India ranked 129 out of 189 countries. The gender gap is also present in the higher education system (Chandra, 2019; United Nations Development Programme, 2019). (Worobeyet al., 2006) examined the authorship of academic medical literature covering a period of 35 years, selecting the first and last (senior) authors of published articles. Over the review period, papers that were first-authored by women increased in number from 5.9 % in 1970 to 29.3 % in 2004. In a 2002 survey (Prpic, 2002) of 840 research scientists in Croatia, scientific production of young scholars was reported to have increased. However, women were reported as having published on average two fewer research papers than men had over the five years prior to the study being carried out.

Very few studies address the gender gap in research productivity in India. One notable study (Thelwall, Bailey, Makita, Sud, & Madalli, 2019) compared Indian publications with those from the USA. The article concluded that there were fewer female authors in India compared to the USA. However the three disciplines of Dentistry, Economics, and Maths did not follow this trend, with more female authors being found in India. In a study examining the gender bias in academic contributions in Kashmir, India (Kaw & Ahmad, 2014), authors carried out a search of the Scopus database, identifying 106 authors and 1,160 research papers. Of this sample, 1,094 papers were contributed by men, and only 66 by women. Gender disparity exists throughout the scientific disciplines, with men consistently exhibiting higher visibility than women (Prpic, 2002; Kosmulski, 2015). In management, citations of publications by men and women were found to only marginally differ (Nielsen, 2017). Similarly, in health sciences, contributions by women outnumbered those by men (Pietri, Johnson, Ozgumus, & Ozgumus, 2018). A study conducted in the UK (Scarman, 2013) found the research productivity of academics in LIS not to significantly differ between men and women, however, men had significantly higher numbers of citations at the reader level. Further, in an analysis of the two LIS journals, LIBRES and Information Research (Reece-Evans, 2010), women authors contributed more papers than men authors between 1995 and 2007. More recent studies (Bisaria & Jaiswal, 2018; Patel & Kumar Verma, 2020), reported that women contributed fewer articles than males in the Sarada Ranganathan Endowment for Library Science (SRELS) Journal of Information Management. Similarly (B T et al., 2018), 72.30% of articles published by Indian authors in LIS Emerald journals between 2008 and 2017 were by men, whereas only 27.69% were contributed by women. Likewise (Bisaria, 2018), the gender gap of papers published in the DESIDOC Journal of Library and Information Technology was examined over a 10-year period, revealing 75.38% of publications to have been contributed by men, compared to 35.15% by women. Many studies have been conducted in different research areas, at the national and international level, across a

variety of countries. However, no comprehensive gender-based analysis of LIS research has been conducted in India.

Objectives

The following research questions are to examine in the current study

- Do women publish fewer papers than men?
- Do female authors have lower annual productivity than male authors?
- Are articles published by women less cited than articles published by men?
- Do women publish more in national journals than international journals?
- In which journals do men and women publish more research papers?
- In which research areas do men and women publish more research papers?

Method:

To address the above research questions, the Scopus database was used, as it is reported to index a wider scope of social science publications than does Web of Science (Falagas, Pitsouni, Malietzis, & Pappas, 2008). Bibliographic data were extracted from Scopus using the advanced search function (Affiliation: India and subject: Library and Information Science). The date range of publications was limited to between the years of 1999 and 2018. The study only identified the gender of the first author of each publication (Worobeyet al., 2006;Thelwall, Bailey, Makita, Sud, & Madalli, 2019), as the first author is considered to have contributed more to the publication than their co-authors (Thelwall, Bailey, Makita, & Sud, 2019). If the first name of the author was not given in the exported bibliographical data, then the author was identified using another database entry on Scopus, or by consulting databases and search engines such as Google Scholar, ResearchGate, Academia, personal blogs, personal and organizational websites, etc. If the gender of the first author was in doubt, their publications were excluded from this study.

Data analysis

Finally, the percentage of publications was calculated by first author gender. Analyses were performed in Microsoft Excel. VoSviewer was used for data visualisation, analyses of publication keywords by gender, and analyses of co-authors by gender.

Results

A total of 1,195 publications were analysed. Table 1 show the annual publications by the gender of the first author. In total, 887 (75.15%) first authors were male, and 308 (24.85%) first authors were female. Closer inspection of the data revealed significant increases in publication rates for some pairs of successive years. For example, publications by men were 100% in 2001, and

94.73% in 2012. Whereas, the growth was slower during the year 2007 when the number of publications contributed by women increased to 47%, which represented the only year where the number of publications first authored by men and women was not statistically different. There were no publications contributed by female first authors in 2001. Overall, publications by male first authors outnumbered those by women between 1999 and 2018.

Year	No. of Documents	Male	Percentage	Female	Percentage
1999	11	9	81.81	2	18.18
2000	10	8	80	2	20
2001	13	13	100	0	0
2002	19	18	94.73	1	5.26
2003	25	21	84	4	16
2004	20	14	70	6	30
2005	20	17	85	3	15
2006	27	21	77.78	6	22.22
2007	23	12	52.18	11	47.82
2008	32	19	59.38	13	40.62
2009	39	22	56.41	17	43.58
2010	58	36	62.07	22	37.93
2011	68	45	66.18	23	33.82
2012	102	81	79.41	21	20.58
2013	113	91	80.53	22	19.46
2014	137	106	77.37	31	22.62
2015	124	96	77.41	28	22.58
2016	110	83	75.45	27	24.54
2017	127	91	71.65	36	28.34
2018	117	84	71.8	33	28.2
Grand Total	**1195**	**887**	**75.15**	**308**	**24.85**

Table 1: Numbers of published articles by year and first-author gender.

The numbers of citations attracted by year and by gender can be seen in Table 2. Out of the total sample of 1,195 articles, 937 received at least one citation, while 258 articles received no citations at all. Of the 887 articles first authored by men, 702 papers (79%) received a total of 4,346 citations (an average of 6.2 citations per cited article, and an average of 4.9 citations per article authored by a man). Of the 308 articles first authored by women, 235 (76%) received a total of 1,398 citations (an average of 5.9 citations per cited article, and an average of 4.5 citations per article authored by a woman). On average male authors received 7.98 citations per year, and female authors received 8.27 citations per year. Papers authored by women received a higher annual citations across the time period. However, the average citations of male and female

authors fluctuated over time. In 2000, from 2004 to 2006 and in 2012, the average number of citations per paper was higher for women than for men.

Year	No. of Article Cited	Male Authors	Citation	Male Average Citation	No. of Article Cited	Female Authors	Citation	Female Average Citation	Total Cited Documents	Non-Cited Documents	Total No. of Articles
1999	9	9	88	9.77	1	2	8	8	10	1	11
2000	7	8	51	7.28	2	2	79	39.5	9	1	10
2001	13	13	154	11.84	0	0	0	0	13	0	13
2002	13	18	60	4.61	1	1	3	3	14	5	19
2003	14	21	101	7.21	2	4	6	3	16	9	25
2004	13	14	111	8.53	6	6	62	10.33	19	1	20
2005	16	17	230	14.37	3	3	52	17.33	19	1	20
2006	19	21	239	12.57	6	6	117	19.5	25	2	27
2007	11	12	158	14.33	10	11	119	11.9	21	2	23
2008	17	19	132	7.76	13	13	84	6.46	30	2	32
2009	16	22	166	10.37	14	17	122	8.71	30	9	39
2010	35	36	451	12.88	19	22	154	8.1	54	4	58
2011	38	45	387	10.18	23	23	135	5.86	61	7	68
2012	66	81	320	4.84	15	21	76	5.06	81	21	102
2013	77	91	351	4.55	21	22	92	4.38	98	15	113
2014	93	106	433	4.65	26	31	90	3.46	119	18	137
2015	81	96	407	5.02	17	28	49	2.88	98	26	124
2016	63	83	216	3.39	18	27	62	3.44	81	29	110
2017	68	91	212	3.11	23	36	58	2.52	91	36	127
2018	33	84	79	2.39	15	33	30	2	48	69	117
Total	**702**	**887**	**4346**	**7.98**	**235**	**308**	**1398**	**8.27**	**937**	**258**	**1195**

Table 2: Year-wise citation of Documents by Gender

As shown in Table 3, of the total 887 papers with male first authors, 23 articles were published with BM Gupta as the first author, making him the most prolific author in the period, followed by S Kumar and RK Bhardwaj with 17 and 16 articles respectively. Similarly, as shown in Table 4, 13 of the total 308 papers published by women, are attributed to M Tripathi, making her the most prolific female author, followed by A Kaur, with 8 articles. In a comparison of the H-Index between men and women first authors in the sample, the H-Index of men ranked comparatively higher than that of women .

S.L. No.	Male Author	No. of Papers	H-Index	Rank
1	Gupta B.M.	23	7	1
2	Kumar S.	17	5	2
3	Bhardwaj R.K.	16	5	3
4	Gul S.	14	4	5
5	Prathap G.	13	6	6
6	Khan A.M.	13	3	6
7	K.C. Garg	12	3	7
8	Ram S.	12	3	7
9	Gupta D.K.	12	2	7
	Above 3 Authors	200		
	Double Authors	396		
	Single Author	291		

Table 3**:** Most Prolific Male Author

Sl. No	Female Author	No. of Papers	H-Index	Rank
1	Tripathi M.	13	5	1
2	Kaur A.	8	3	2
3	Anuradha K.T.	6	2	3
4	Ghosh M.	6	4	3
5	Sawant S.	6	3	3
6	Sheeja N. K.	6	2	3
7	Hirwade M. A.	5	1	4
8	Kaur H.	5	1	4
9	Saxena S.	5	2	4
	Above 3 Authors	57		
	Double Authors	142		
	Single Author	109		

Table 4: Most Prolific Female Author

Table 5 shows the number of publications that had one, two, or at least three authors. These data indicated that the most common number of authors was two, as articles with two authors where the first is male represented 33.13% of all articles, where the first is female represented 11.88%. Next most common were single author publications, which represented 24.35% and 9.12% of the total sample by men and women respectively. Finally, papers with three or more authors made up the smallest contribution.

Authorship pattern	Number of Publications	%
Single Author (Male First)	291	24.35
Single Author (Female First)	109	9.12
Double Authors (Male First)	396	33.13
Double Authors (Female First)	142	11.88
More Than Three Authors (Male First)	200	16.73
More Than Three Authors (Female First)	57	4.76
Total	1195	100%

Table 5: Number of co-authors by gender of the first author

Journal choice by gender

Tables 6 and 7 show the top ten most common journals of publications by men and women, respectively, between 1999 and 2018. There were no significant differences found. Both male and female first authors published most frequently in the DESIDOC Journal of Library and Information Technology, with 24.92% of articles by men and 24.03% of articles by women being published there. However, closer inspection shows some differences in these lists, for instance men contributed 2.375% of their articles to Collection Building, whereas this journal did not reach the top ten for women. Similarly, 2.60% of articles authored by women were published in Library Management, which saw no contributions from men during the study period.

Rank	Name of the Journals	No of Publications	%
1	DESIDOC Journal of Library and Information Technology	221	24.92
2	Annals of Library and Information Studies	155	17.47
3	International Information and Library Review	65	7.33
4	Scientometrics	58	6.54
5	Electronic Library	53	5.98
6	Library Hi Tech News	34	3.83

7	Malaysian Journal of Library and Information Science	35	3.95
8	Library Review	26	2.93
9	Program	18	2.03
10	Collection Building	21	2.37
-	Other		

Table 6: Top 10 Journals published in by Male Authors

Rank	Name of the Journals	Female Author	Percentage
1	DESIDOC Journal of Library and Information Technology	74	24.03
2	International Information and Library Review	42	13.64
3	Annals of Library and Information Studies	34	11.04
4	Scientometrics	15	4.87
5	Electronic Library	14	4.55
6	Library Hi Tech News	11	3.57
7	Library Review	11	3.57
8	Program	11	3.57
9	Library Management	8	2.60
10	Malaysian Journal of Library and Information Science	7	2.27
-	Other		

Table 7: Top 10 journals published in by Female Authors

Figures 2 and 3 represent the co-authorship network of international collaborators by country of women and men first authors, respectively. The font size represents the number of publications with co-authors in the country, line weight represents the strength of the collaboration between the two countries and color represents the cluster. Men had a higher overall number of collaborations than women. Both men and women had strong collaborations with the USA. Male authors also strong collaborations with Belgium, Saudi Arabia, Malaysia, UK, Germany, and Swaziland, while no such strong collaborations were found in the papers first authored by women.

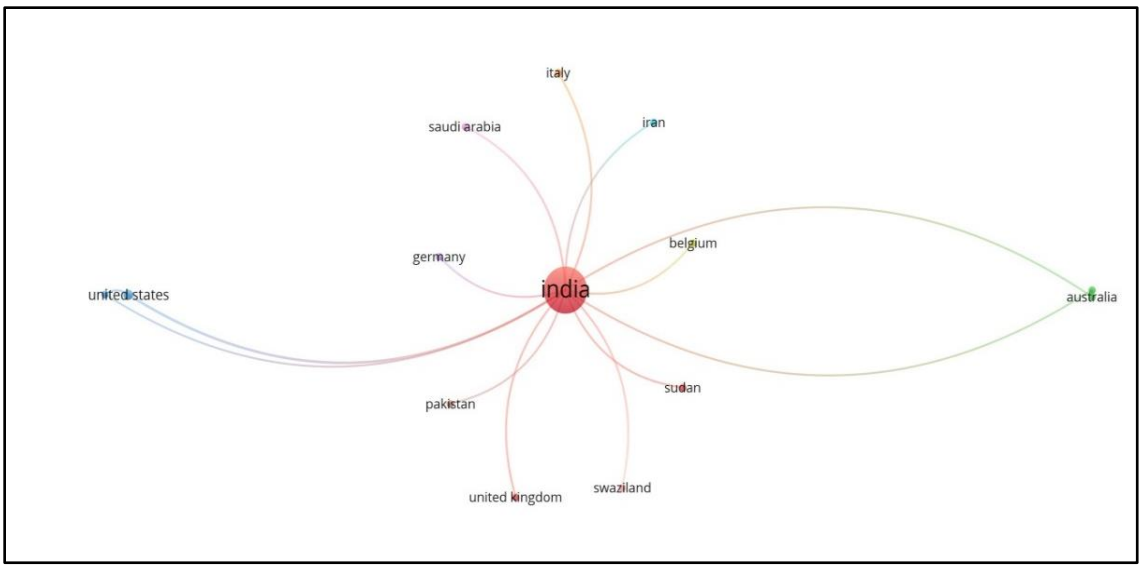

Figure-1: International co-authorships in papers first authored by women

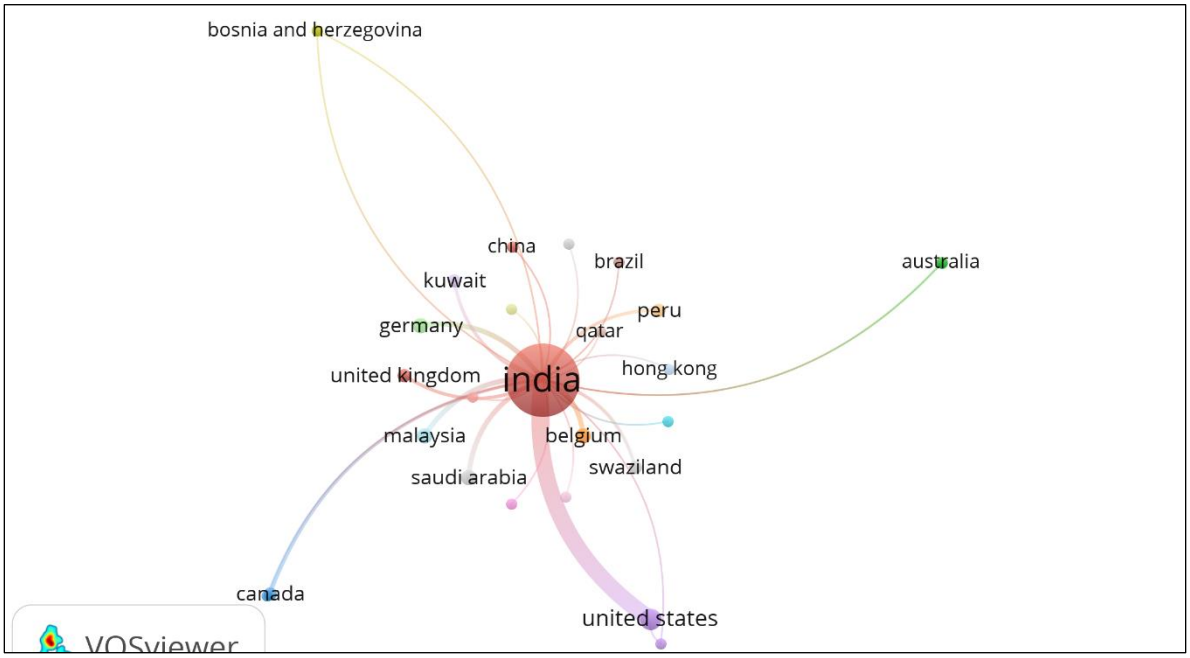

Figure-2: International co-authorships in papers first authored by men

Figures 4 and 5 show the results of keyword analysis by gender by providing a visualisation of the most frequently used keywords of articles in the sample. Figure 4 shows the keyword analysis of papers first authored by men, and Figure 5 for women. Font size and node size represent the frequency of use of that keyword. In papers by men and women, the most frequent

keyword was "India". Following this, keywords of papers by men included "Bibliometrics", "Scientometrics", "Information retrieval", "web 2.0" and "academic libraries", whereas those by women included "Digital Library", "Bibliometrics", "Academic Libraries", "E-resources", and "University libraries".

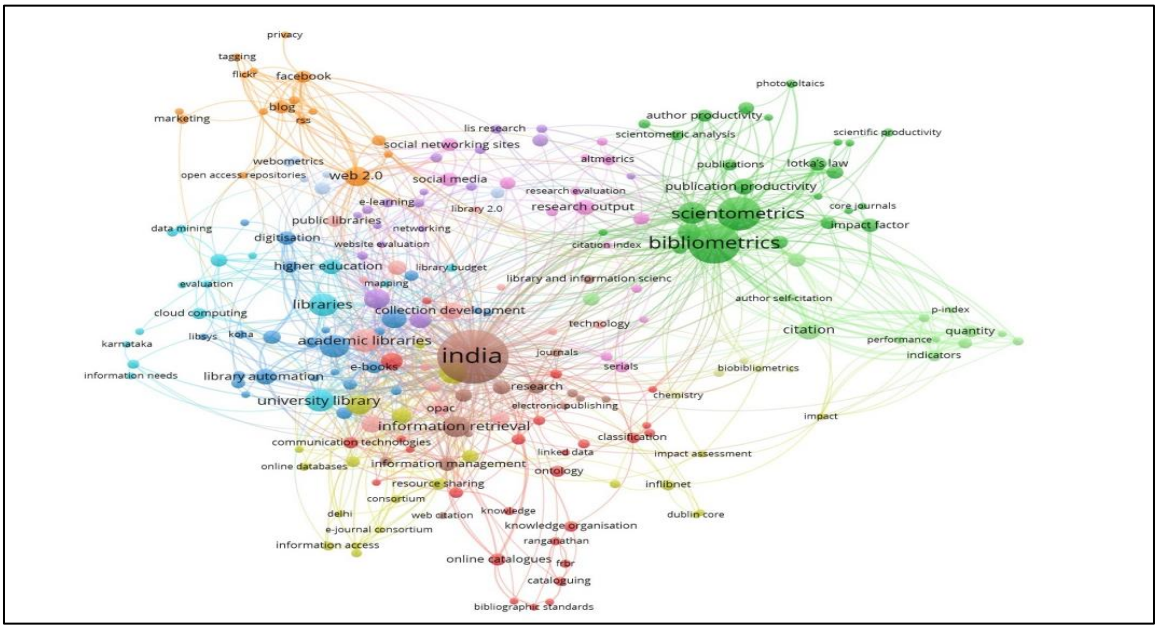

Figure 3: Keyword analysis of papers first-authored by men

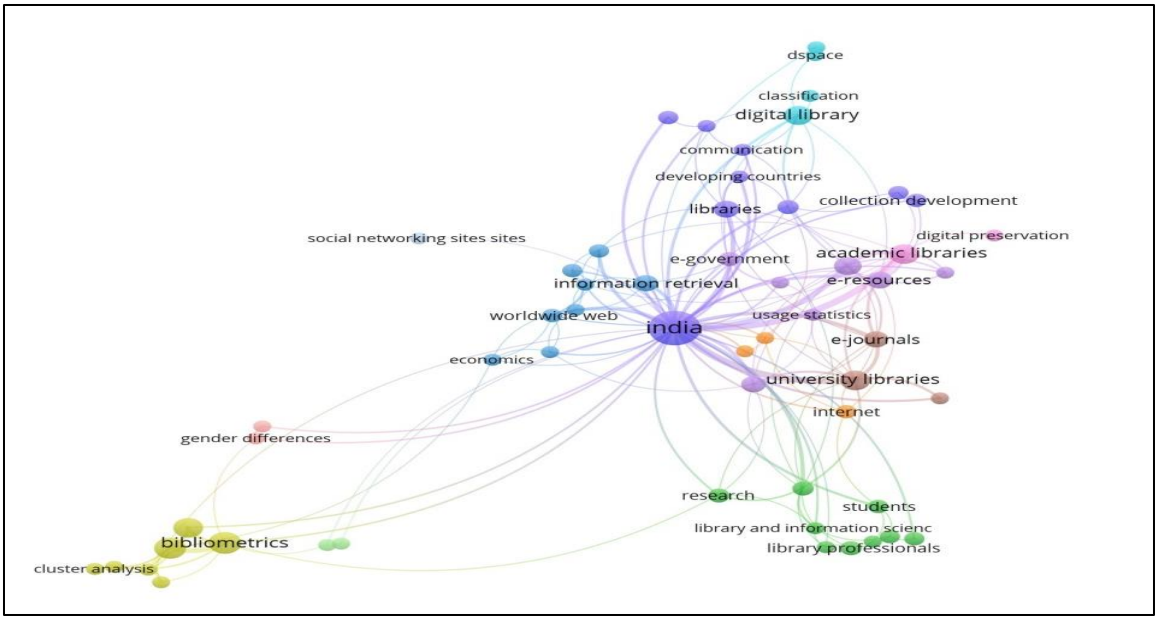

Figure 4: Keyword analysis of papers first authored by women

Table 8 shows the number of publications in national and international journals within the sample, by gender. Both men and women published over half of their publications in international journals (58% for men and 65% for women). Consequently, women and men published 35% and 42% of their papers in national publications, respectively.

Publications	Female First Authors	Male First Authors	Proportion of all Female First Author Articles	Proportion of all Male First Author Articles	Total Publications
National	108	376	108/308 = 35%	376/887 = 42%	484 (41%)
International	200	511	200/308 = 65%	511/887 = 58%	711 (59%)
Total	308	887	100%	100%	1195

Table 8: National and international publications by gender

Discussion and Conclusion

This study analysed the Indian research contribution to the area of library and information science (LIS) during the period 1999 to 2018, by the gender of the first author. This is the first analysis of its kind in India to quantitatively assess the gender disparity found in LIS research publications. From the total 1,195 publications found, 887 (75.15%) were first authored by men and 308 (24.85%) by women. Overall, the research outputs of male first authors were more numerous than those of female first authors. Analyses of the citation rate of articles within the sample showed that 937 articles had attracted at least one citation while 258 articles had no citations at all. Of the articles first authored by men, 702 attracted a total of 4,346 whereas 235 articles by women attracted 1,398 citations. On average, male authors yearly average citation rate was 7.98, which was lower than the female authors yearly average citation rate of 8.27.

With regard to the productivity of first authors within the sample, men were more productive than women. The most common number of co-authors on a paper was a total of two authors, followed by single author papers, and finally papers with three or more authors. This pattern did not have a significant interaction with the gender of the first author. There were no significant gender differences in the list of journals represented in the sample. Male and female authors were equally highly interested in collaborating on research papers with authors in the United States, but men had stronger links with authors in other countries than did females. India is the most common keyword used by both men and women in this study. In the study period, female authors published a higher proportion of their papers in international publications compared to male authors.

The results of the present study show that the research output of men was greater, than that of women during the study period, as assessed by the number of first-author publications indexed by Scopus between 1999 and 2018. Consequently, gender parity in Indian LIS publications may be some way off. As such, further research is required to highlight and mitigate the issues experienced by women in academia in order to increase productivity in the LIS field in India.

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